MOTORCYCLES

Like many law enforcement agencies, the Michigan State Police used motorcycles up until late 1941 and then switched to automobiles. The Michigan State Police rekindled interest in motorcycles for day to day patrol operations in 1993. In 2004, Michigan State Police headquarters asked if we had additional information as a resource for our purchasing decisions regarding motorcycles. During that time we were given direction to expand vehicle testing to include motorcycle testing. We are pleased to announce the second MSP police motorcycle test. We would like to thank Harley Davidson and BMW for participating and providing their assistance in preparation for this year's successful testing program.

We are constantly evaluating our various tests with the manufacturers and the law enforcement industry to provide you with the most objective test data available. While there are many similarities to automobiles, there are also quite a few differences. Law enforcement motorcycles will encounter a variety of surfaces during patrol operations or emergencies. Because of that, we developed a braking test with substantially different coefficient of friction surfaces. An example of this in the real world would be if a motor officer was run off the road and on to a gravel or a wet grassy surface and had to brake at the same time.

When looking at the data, it is very important for the reader to apply your mission requirements to the motorcycle you are considering so you may make an appropriate decision. This report is not an endorsement of products, but a means of learning what's available for your officers so they can do their job more effectively and safely. If anything in this report requires further explanation or clarification, please call or write.

Harley Davidson
Road King (FLHP)

TEST VEHICLE DESCRIPTION

MAKE Harley Davidson	**MODEL** FLHP		**SALES CODE NO.** N/A
ENGINE DISPLACEMENT	**CUBIC CENTIMETERS** 1690		**CUBIC INCHES** 103
FUEL SYSTEM	EFI		**EXHAUST** Crossover Dual
BORE & STROKE	3.75 x 4.38 in		**ALTERNATOR** 3 phase 50 amp
TORQUE	102 Ft Lbs		**BATTERY** 28 Amp Hour
COMPRESSION RATIO	9.6/1		
TRANSMISSION	**PRIMARY DRIVE** 34/46		**FINAL DRIVE** 32/66
GEAR RATIO	2.79 overall		
LEAN ANGLE	**LEFT** 30 Deg		**RIGHT** 32 Deg
CLUTCH	Wet multiple plate		
WHEELS/TIRES	3x16 MT/90-16 72H		
FRONT SUSPENSION	**FORK ANGLE** 29.3 Deg		**RAKE** 26 Deg
REAR SUSPENSION	Swing Arm		
SUSPENSION TRAVEL	**FRONT** 4.6 in		**REAR** 3.0 in
GROUND CLEARANCE, MINIMUM	5.1 in.		
BRAKE SYSTEM	Disc		
BRAKES, FRONT	**TYPE** Dual Disc		**SWEPT AREA** 180sq in
BRAKES, REAR	**TYPE** Single Disc		**SWEPT AREA** 90sq in
FUEL CAPACITY	**GALLONS** 6		**LITERS**
OIL CAPACITY	4Qts		
GENERAL MEASUREMENTS	**WHEELBASE** 63.5 in		**LENGTH** 93.7
	TEST WEIGHT 798 lbs.		**OVERALL HEIGHT** 61 in.
	SEAT HEIGHT 30 in.		
EPA MILEAGE EST. (MPG)	**CITY** 32.5	**HIGHWAY** 45	**COMBINED**

Harley Davidson
Electra Glide (FLHTP)

TEST VEHICLE DESCRIPTION

MAKE Harley Davidson	**MODEL** FLHTP		**SALES CODE NO.** N/A
ENGINE DISPLACEMENT	**CUBIC CENTIMETERS** 1690		**CUBIC INCHES** 103
FUEL SYSTEM	EFI		**EXHAUST** Crossover Dual
BORE & STROKE	3.75 x 4.38 in		**ALTERNATOR** 3 phase 50 amp
TORQUE	102 Ft Lbs		**BATTERY** 28 Amp Hour
COMPRESSION RATIO	9.6/1		
TRANSMISSION	**PRIMARY DRIVE** 34/46		**FINAL DRIVE** 32/66
GEAR RATIO	2.79 overall		
LEAN ANGLE	**LEFT** 30 Deg		**RIGHT** 32 Deg
CLUTCH	Wet multiple plate		
WHEELS/TIRES	3x16 MT/90-16 72H		
FRONT SUSPENSION	**FORK ANGLE** 29.3 Deg		**RAKE** 26 Deg
REAR SUSPENSION	Swing Arm		
SUSPENSION TRAVEL	**FRONT** 4.6 in		**REAR** 3.0 in
GROUND CLEARANCE, MINIMUM	5.1 in.		
BRAKE SYSTEM	Disc		
BRAKES, FRONT	**TYPE** Dual Disc		**SWEPT AREA** 180sq in
BRAKES, REAR	**TYPE** Single Disc		**SWEPT AREA** 90sq in
FUEL CAPACITY	**GALLONS** 6		**LITERS**
OIL CAPACITY	4Qts		
GENERAL MEASUREMENTS	**WHEELBASE** 63.5 in		**LENGTH** 93.7
	TEST WEIGHT 799 lbs.		**OVERALL HEIGHT** 61 in.
	SEAT HEIGHT 30 in.		
EPA MILEAGE EST. (MPG)	**CITY** 32.5	**HIGHWAY** 45	**COMBINED**

BMW
R1200RT-P

TEST VEHICLE DESCRIPTION

MAKE BMW	**MODEL** R1200RT-P		**SALES CODE NO.** 07RB
ENGINE DISPLACEMENT	**CUBIC CENTIMETERS** 1170		**Engine** 2-Cylinder
FUEL SYSTEM	Injection		**EXHAUST** Stainless Steel with Catalytic Converter
BORE & STROKE	101 mm x 73 mm		**ALTERNATOR** 720 W
TORQUE	85 lb/ft @ 6,000 rpm		**BATTERY** 2 batteries at 19 Amp hours each
COMPRESSION RATIO	12.0 : 1		
TRANSMISSION	**PRIMARY DRIVE** Gear 1:1.882		**FINAL DRIVE** No Maintenance Shaft Drive
GEAR RATIO	1 : 2.75 rear drive ratio		
LEAN ANGLE	**LEFT** 46 degrees		**RIGHT** 46 degrees
CLUTCH	Self-adjusting Hydraulic Actuating Single Plate Dry Clutch		
WHEELS/TIRES	Die-cast Aluminum MTH2 Rim Profile fitted with Run-Flat Tires (meets California Highway Patrol Run-Flat Protocol)		
FRONT SUSPENSION	**FORK ANGLE** 63.4 BMW Telelever		**RAKE** (Castor in normal position) 4.3 inches
REAR SUSPENSION	BMW Evo Paralever		
SUSPENSION TRAVEL	**FRONT** 4.7 inches		**REAR** 5.3 Inches
GROUND CLEARANCE, MINIMUM	6.1 in.		
BRAKE SYSTEM	BMW/ABS Partially Integrated Brake System		
BRAKES, FRONT	**TYPE** Dual 12.6 “Disc		**SWEPT AREA** 186 sq. in.
BRAKES, REAR	**TYPE** Single 10.4” Disc		**SWEPT AREA** 62.3 sq. in.
FUEL CAPACITY	**GALLONS** 7.1 Gal		**LITERS** 27
OIL CAPACITY	4 Qts.		
GENERAL MEASUREMENTS	**WHEELBASE** 58.4 inches		**LENGTH** 87.8 inches
	TEST WEIGHT 695 lbs.		**OVERALL HEIGHT** 56.3 “
	***SEAT HEIGHT** 32.2 “		
EPA MILEAGE EST. (MPG) (Based on DIN standard test)	**CITY** N/A	**HIGHWAY** 48 @ 75mph 65 @ 55mph	**COMBINED** N/A

*Seat height has two adjustment positions. A low seat is available making the seat height 31”.

TEST VEHICLE DESCRIPTION SUMMARY

	Harley Davidson FLHP	Harley Davidson FLHTP	BMW
CUBIC CENTIMETERS	1690	1690	1170
ENGINE DISPLACEMENT – CU. IN.	103	103	71.4
ENGINE FUEL SYSTEM	EFI	EFI	Injection
EXHAUST	Crossover Dual	Crossover Dual	Stainless Steel
BORE & STROKE	3.75x4.38 (inches)	3.75x4.38 (inches)	101x73 (mm)
ALTERNATOR	3 phase, 50 amp	3 phase, 50 amp	720 watts
TORQUE - FT. LBS.	102	102	85
BATTERY	28	28	2x19
COMPRESSION RATIO	9.6/1	9.6/1	12.0:1
TRANSMISSION			
PRIMARY DRIVE	34/46	34/46	1:1.882
FINAL DRIVE	32/66	32/66	No Maintenance Shaft Drive
GEAR RATIO	2.79	2.79	1:2.75
LEAN ANGLE - LEFT	30°	30°	46°
LEAN ANGLE – RIGHT	32°	32°	46°
CLUTCH	Wet multi plate	Wet multi plate	Dry single plate
WHEELS/TIRES	3x16 MT/90-16 72H	3x16 MT/90-16 72H	Alum. MTH2
FRONT SUSPENSION			
FORK ANGLE	29.3°	29.3°	63.4°
RAKE	26°	26°	4.3 in.
REAR SUSPENSION	Swing Arm	Swing Arm	EVO Paralever
SUSPENSION TRAVEL – FRONT	4.6 in.	4.6 in.	4.7 in.
SUSPENSION TRAVEL – BACK	3.0 in.	3.0 in.	5.3 in.
GROUND CLEARANCE-MINIMUM	5.1 in.	5.1 in.	5.675 in.
BRAKE SYSTEM	Disc.	Disc.	IABS
FRONT SWEPT AREA (sq. in.)	180	180	186.17
REAR SWEPT AREA (sq. in.)	90	90	62.34
FUEL CAPACITY – GALLONS	6	6	7.1
FUEL CAPACITY – LITERS			27
OIL CAPACITY – QUARTS	4	4	4
WHEELBASE	63.5	63.5	58.4
LENGTH	93.7	93.7	87.8
WEIGHT	798	799	695
OVERALL HEIGHT	61	61	56.3
SEAT HEIGHT	30	30	*32.2
EPA MILEAGE – CITY	32.5	32.5	N/A
EPA MILEAGE - HIGHWAY	45	45	48 @ 75mph 65 @ 55mph

MOTORCYCLE DYNAMICS TESTING

MOTORCYCLE DYNAMICS TEST OBJECTIVE

Determine each motorcycle's high speed handling characteristics and performance in comparison to other motorcycles. The course used contains 9 turns and curves (including a 90 degree left turn, a switch back, a sweeping turn, a high speed turn and a decreasing radius, with different braking requirements) and is .9 miles in length. The course simulates actual conditions encountered in pursuit or emergency driving situations in the field, with the exception of other traffic. The evaluation is a true test of the vehicle manufacturers in offering balanced packages of acceleration capabilities, suspension components, and braking characteristics.

MOTORCYCLE DYNAMICS TEST METHODOLOGY

Each motorcycle is driven using four separate riders for a six lap series. The best 5 out of six laps for each rider will be totaled for a cumulative time. The cumulative time is the score for each driver. The final score of each motorcycle is the combined average from the four rider's cumulative times.

MOTORCYCLE DYNAMICS

VEHICLES	DRIVERS	COMBINED CUMULATIVE
Harley Davidson	GROMAK	06:16.9
FLHTP	JOHNSON	06:16.8
Electra Glide	TRAMMEL	06:28.4
	FLEGEL	06:14.2
Overall Average		06:19.0
Harley Davidson	GROMAK	06:17.3
FLHP	JOHNSON	06:14.4
Road King	TRAMMEL	06:25.1
	FLEGEL	06:12.1
Overall Average		06:17.4
BMW	GROMAK	05:42.0
R1200RTP	JOHNSON	05:48.7
	TRAMMEL	06:03.8
	FLEGEL	05:43.2
Overall Average		05:49.4

MOTORCYCLE ACCELERATION AND TOP SPEED TESTING

ACCELERATION TEST OBJECTIVE

Determine the ability of each test motorcycle to accelerate from a standing start to 60 mph, 80 mph, and 100 mph, and determine the distance to reach 110 mph and 120 mph.

ACCELERATION TEST METHODOLOGY

Using a Microsat GPS speed and distance sensor, each motorcycle is driven through four acceleration sequences, two northbound and two southbound, to allow for wind direction. The four resulting times for each target speed are averaged and the average times used to derive scores on the competitive test for acceleration.

TOP SPEED TEST OBJECTIVE

Determine the actual top speed attainable by each test motorcycle within a distance of 10 miles from a standing start.

TOP SPEED TEST METHODOLOGY

Following the fourth acceleration run, each test motorcycle will continue to accelerate to the top speed attainable within 10 miles from the start of the run. The highest speed attained within the 10-mile distance will be the vehicle's score on the competitive test for top speed.

SUMMARY OF ACCELERATION & TOP SPEED

ACCELERATION*		Harley Davidson FLHP	Harley Davidson FLHTP	BMW
0 – 20 mph	(sec.)	1.29	1.38	1.30
0 – 30 mph	(sec.)	2.06	2.14	2.00
0 – 40 mph	(sec.)	2.83	2.98	2.59
0 – 50 mph	(sec.)	4.05	4.18	3.33
0 – 60 mph	(sec.)	5.59	5.64	4.10
0 – 70 mph	(sec.)	7.22	7.45	5.22
0 – 80 mph	(sec.)	9.88	10.04	6.36
0 – 90 mph	(sec.)	13.46	14.06	8.03
0 – 100 mph	(sec.)	25.44	26.05	10.01
TOP SPEED	**(mph)**	109.1	106.2	130.9
QUARTER MILE				
Time	(sec.)	14.42	14.59	12.74
Speed	(mph)	92.25	91.16	108.27

BRAKE TESTING

BRAKE TEST OBJECTIVE

Determine the deceleration rate attained by each test motorcycle on twelve 60 – 0 mph impending skid (threshold) stops, with ABS in operation if the motorcycle is so equipped. Each bike will be scored on the average deceleration rate it attains.

BRAKE TEST METHODOLOGY

Each motorcycle makes two decelerations at specific predetermined points on the test road from 90 – 0 mph at 22 ft/s^2, with the rider using a decelerometer to maintain the deceleration rate. Immediately after these "heat-up" stops are completed, the motorcycle turns around and makes six measured 60 – 0 mph impending skid (threshold) stops with ABS in operation at specific predetermined points. The entire sequence is repeated. The exact initial velocity at the beginning of each of the 60 – 0 mph decelerations, and the exact distance required to make each stop is recorded by means of a non contact microsat GPS in conjunction with electronic speed and distance meters. The data resulting from the twelve total stops is used to calculate the average deceleration rate which is the motorcycle's score for this test.

DECELERATION RATE FORMULA

$$\text{Deceleration Rate (DR)} = \frac{\text{Initial Velocity*(IV) squared}}{\text{2 times Stopping Distance (SD)}} = \frac{(IV)^2}{2\,(SD)}$$

EXAMPLE:

Initial Velocity = 89.175 ft/s (60.8 mph x 1.4667*)
Stopping Distance = 171.4 ft.

$$DR = \frac{(IV)^2}{2(SD)} = \frac{(89.175)^2}{2(171.4)} = \frac{7952.24}{342.8} = 23.198 \text{ ft/s}^2$$

Once a motorcycle's average deceleration rate has been determined, it is possible to calculate the stopping distance from any given speed by utilizing the following formula:

Select a speed; translate that speed into feet per second; square the feet per second figure by multiplying it by itself; divide the resultant figure by 2; divide the remaining figure by the average deceleration rate of the motorcycle in question.

EXAMPLE:

60 mph = 88.002 ft/s x 88.002 = 7744.352 / 2 = 3872.176 / 23.198 ft/s^2 = 166.9 ft.

BRAKE TESTING

TEST LOCATION: Chrysler Proving Grounds **DATE:** September 17, 2007

BEGINNING Time: 3:30 p.m. **TEMPERATURE:** 55.1°F

MAKE & MODEL: Harley Davidson Electra Glide FLHTP **BRAKE SYSTEM:** Anti-lock

Phase I

BRAKE HEAT-UP: (Two 90 –0 mph decelerations @ 22 ft.sec.$^{2)}$
TEST: (Six 60 – mph impending skid (ABS) maximum deceleration rate stops)

	Initial Velocity	Stopping Distance	Deceleration Rate
Stop #1	59.5 mph	178.0 feet	21.40 ft/s^2
Stop #2	59.7 mph	161.5 feet	23.69 ft/s^2
Stop #3	59.4 mph	164.6 feet	23.02 ft/s^2
Stop #4	60.2 mph	175.0 feet	22.28 ft/s^2
Stop #5	60.1 mph	177.2 feet	21.89 ft/s^2
Stop #6	60.0 mph	174.2 feet	22.20 ft/s^2

AVERAGE DECELERATION RATE 22.41 ft/s^2

Phase II

BRAKE HEAT-UP: (Two 90 –0 mph decelerations @ 22 ft.sec.$^{2)}$
TEST: (Six 60 – mph impending skid (ABS) maximum deceleration rate stops)

	Initial Velocity	Stopping Distance	Deceleration Rate
Stop #1	60.5 mph	176.2 feet	22.31 ft/s^2
Stop #2	59.5 mph	173.5 feet	21.96 ft/s^2
Stop #3	59.2 mph	170.7 feet	22.12 ft/s^2
Stop #4	60.1 mph	176.3 feet	22.04 ft/s^2
Stop #5	60.4 mph	175.6 feet	22.34 ft/s^2
Stop #6	60.3 mph	171.1 feet	22.82 ft/s^2

AVERAGE DECELERATION RATE 22.27 ft/s^2

Phase III

	Yes/No
Evidence of severe fading?	No
Vehicle stopped in straight line?	Yes
Vehicle stopped within correct lane?	Yes

OVERALL AVERAGE DECEL. RATE: 22.34 ft/s^2

Projected Stopping Distance from 60.0 mph 173.3

BRAKE TESTING

TEST LOCATION: Chrysler Proving Grounds **DATE:** September 17, 2007

BEGINNING Time: 3:00 p.m. **TEMPERATURE:** 55.9°F

MAKE & MODEL: Harley Davidson Road King FLHP **BRAKE SYSTEM:** Anti-lock

Phase I

BRAKE HEAT-UP: (Two 90 –0 mph decelerations @ 22 ft.sec.$^{2)}$
TEST: (Six 60 – mph impending skid (ABS) maximum deceleration rate stops)

	Initial Velocity	Stopping Distance	Deceleration Rate
Stop #1	60.2 mph	168.6 feet	23.09 ft/s^2
Stop #2	59.9 mph	161.4 feet	23.92 ft/s^2
Stop #3	59.6 mph	176.6 feet	21.62 ft/s^2
Stop #4	60.2 mph	177.3 feet	21.98 ft/s^2
Stop #5	59.9 mph	174.3 feet	22.11 ft/s^2
Stop #6	59.5 mph	169.2 feet	22.50 ft/s^2

AVERAGE DECELERATION RATE 22.54 ft/s^2

Phase II

BRAKE HEAT-UP: (Two 90 –0 mph decelerations @ 22 ft.sec.$^{2)}$
TEST: (Six 60 – mph impending skid (ABS) maximum deceleration rate stops)

	Initial Velocity	Stopping Distance	Deceleration Rate
Stop #1	59.9 mph	170.2 feet	22.64 ft/s^2
Stop #2	59.7 mph	177.1 feet	21.65 ft/s^2
Stop #3	59.4 mph	171.2 feet	22.14 ft/s^2
Stop #4	59.5 mph	171.7 feet	22.17 ft/s^2
Stop #5	60.2 mph	160.7 feet	24.26 ft/s^2
Stop #6	59.3 mph	164.0 feet	23.09 ft/s^2

AVERAGE DECELERATION RATE 22.66 ft/s^2

Phase III

	Yes/No
Evidence of severe fading?	No
Vehicle stopped in straight line?	Yes
Vehicle stopped within correct lane?	Yes

OVERALL AVERAGE DECEL. RATE: 22.60 ft/s^2

Projected Stopping Distance from 60.0 mph 171.4

BRAKE TESTING

TEST LOCATION: Chrysler Proving Grounds **DATE:** September 17, 2007

BEGINNING Time: 3:50 p.m. **TEMPERATURE:** 56.9°F

MAKE & MODEL: BMW R1200RTP **BRAKE SYSTEM:** Anti-lock

Phase I

BRAKE HEAT-UP: (Two 90 –0 mph decelerations @ 22 ft.sec.$^{2)}$
TEST: (Six 60 – mph impending skid (ABS) maximum deceleration rate stops)

	Initial Velocity	Stopping Distance	Deceleration Rate
Stop #1	59.0 mph	135.3 feet	27.69 ft/s^2
Stop #2	59.4 mph	133.8 feet	28.37 ft/s^2
Stop #3	60.3 mph	141.6 feet	27.62 ft/s^2
Stop #4	60.2 mph	143.5 feet	27.17 ft/s^2
Stop #5	60.6 mph	144.0 feet	27.42 ft/s^2
Stop #6	59.9 mph	138.0 feet	28.00 ft/s^2

AVERAGE DECELERATION RATE 27.71 ft/s^2

Phase II

BRAKE HEAT-UP: (Two 90 –0 mph decelerations @ 22 ft.sec.$^{2)}$
TEST: (Six 60 – mph impending skid (ABS) maximum deceleration rate stops)

	Initial Velocity	Stopping Distance	Deceleration Rate
Stop #1	59.9 mph	153.5 feet	25.17 ft/s^2
Stop #2	60.2 mph	146.4 feet	26.59 ft/s^2
Stop #3	60.5 mph	145.2 feet	27.09 ft/s^2
Stop #4	60.6 mph	124.6 feet	31.66 ft/s^2
Stop #5	59.4 mph	130.9 feet	29.02 ft/s^2
Stop #6	60.0 mph	136.1 feet	28.47 ft/s^2

AVERAGE DECELERATION RATE 28.00 ft/s^2

Phase III

	Yes/No
Evidence of severe fading?	No
Vehicle stopped in straight line?	Yes
Vehicle stopped within correct lane?	Yes

OVERALL AVERAGE DECEL. RATE: 27.86 ft/s^2

Projected Stopping Distance from 60.0 mph 139.0

HIGH TO LOW Um TRANSITION ANTI-LOCK BRAKE SYSTEM TEST

TEST OBJECTIVE

Determine the deceleration rate attained by each test motorcycle during the best five out of six 40-0 mph ABS panic stops on a transitional brake surface.

TEST METHODOLOGY

The motorcycle is accelerated to 40 mph and both brakes (front and rear) applied simultaneously to simulate an ABS panic stop. The initial deceleration begins on a dry asphalt surface (with a relatively high coefficient of friction-high uM) and transitions 30 feet further to a wet seal coated skid pad surface (with a relatively low coefficient of friction-low uM). The exact initial velocity at the beginning of each 40 mph – 0 decelerations and the exact distance required to make each stop is recorded by means of a Microsat GPS non contact sensor measuring speed and distance. The data from the best 5 out of 6 total stops is used to calculate the average deceleration rate which is the vehicle's score for this test.

TEST LOCATION: Precision Driving Unit, Lansing

DATE: September 16, 2007

BEGINNING Time: 2:45 p.m.

TEMPERATURE: 64°F

MAKE & MODEL: Harley Davidson FLHTP-Electra Glide

BRAKE SYSTEM: Anti-lock

Phase I

TEST: Determine the deceleration rate attained by each test motorcycle during the best five out of six 40-0 mph ABS panic stops on a transitional brake surface.

	Initial Velocity	Stopping Distance	Deceleration Rate
Stop #1	37.25 mph	101.05 feet	14.77 ft/s^2
Stop #2	38.56 mph	113.87 feet	14.04 ft/s^2
Stop #3	37.86 mph	113.19 feet	13.62 ft/s^2
Stop #4	39.70 mph	135.61 feet	12.70 ft/s^2
Stop #5	38.48 mph	117.06 feet	13.62 ft/s^2

AVERAGE DECELERATION RATE **13.71 ft/s^2**

Phase II

	Yes/No
Evidence of severe fading?	No
Vehicle stopped in straight line?	Yes

Projected Stopping Distance from 40.0 mph 125.6

HIGH TO LOW Um TRANSITION ANTI-LOCK BRAKE SYSTEM TEST

TEST LOCATION: Precision Driving Unit, Lansing

DATE: September 16, 2007

BEGINNING TIME: 2:00 p.m.

TEMPERATURE: 64°F

MAKE & MODEL: Harley Davidson FLHP-Road King

BRAKE SYSTEM: Anti-lock

Phase I

TEST: Determine the deceleration rate attained by each test motorcycle during the best five out of six 40-0 mph ABS panic stops on a transitional brake surface.

	Initial Velocity	Stopping Distance	Deceleration Rate
Stop #1	38.20 mph	124.18 feet	12.64 ft/s^2
Stop #2	36.87 mph	121.72 feet	11.99 ft/s^2
Stop #3	38.28 mph	119.65 feet	12.95 ft/s^2
Stop #4	37.69 mph	125.29 feet	12.20 ft/s^2
Stop #5	38.90 mph	122.67 feet	13.27 ft/s^2

AVERAGE DECELERATION RATE 12.66 ft/s^2

Phase II

	Yes/No
Evidence of severe fading?	No
Vehicle stopped in straight line?	Yes

Projected Stopping Distance from 40.0 mph 136.0

TEST LOCATION: Precision Driving Unit, Lansing

DATE: September 16, 2007

BEGINNING Time: 3:30 p.m.

TEMPERATURE: 64°F

MAKE & MODEL: BMW R1200RTP

BRAKE SYSTEM: Anti-lock

Phase I

TEST: Determine the deceleration rate attained by each test motorcycle during the best five out of six 40-0 mph ABS panic stops on a transitional brake surface.

	Initial Velocity	Stopping Distance	Deceleration Rate
Stop #1	41.17 mph	109.20 feet	15.15 ft/s^2
Stop #2	39.56 mph	86.95 feet	19.35 ft/s^2
Stop #3	38.20 mph	97.64 feet	16.07 ft/s^2
Stop #4	40.08 mph	102.00 feet	15.55 ft/s^2
Stop #5	40.92 mph	100.05 feet	16.66 ft/s^2

AVERAGE DECELERATION RATE 17.41 ft/s^2

Phase II

	Yes/No
Evidence of severe fading?	No
Vehicle stopped in straight line?	Yes

Projected Stopping Distance from 40.0 mph 98.8

COMMUNICATIONS

TEST OBJECTIVE

Rate each test motorcycle's ability to:

Accommodate the required communications and emergency warning equipment and assess the relative difficulty of such installations.

TEST METHODOLOGY

The installation and communications portion of the evaluation will be conducted by Canfield Equipment Service, Inc. based upon the relative difficulty of the necessary installations. Each factor will be graded on a 1 to 10 scale, with 1 representing "totally unacceptable," 5 representing "average," and 10 representing "superior." The scores will be averaged to minimize personal prejudice for or against any given motorcycle.

	BMW R1200RTP	FLHP ROAD KING	FLHTP ELECTRA GLIDE
Dash Access			
Ignition Fuse terminal block	7.50	7.50	7.50
Radio-Siren Mounting location	9.00	9.00	9.00
Radio-Installation	7.00	7.00	8.00
Radio Box Position	8.00	8.50	8.50
Emergency Lights	8.00	8.00	8.00
Radio Interference	8.00	8.00	8.00
Radio Box			
Radio Installation	9.00	7.50	7.50
Antenna Installation	8.50	8.50	8.50
Emergency Lights Installation	8.00	7.50	7.50
Engine Access			
Radio Power Conn.	8.00	7.00	7.00
Power/Cont.Cable	6.50	7.00	7.00
TOTAL	**87.50**	**85.50**	**86.50**